

Geel 2000 Language Schools

Science Department

Prep. (1)

Second term

(2023-2024)



Name :……………………………………………………………………

Class:……………………………………………………………………

Unit one
Chemical Reactions

Lesson 1 Chemical Combination

-The number of known elements till now is **118**.
Elements can be classified according to their **properties and electronic structure** into:

(1) Metals | (2) Non-metals | (3) Noble gases

Comparison between metals and non-metals:

P.O.C	Metals	Non- metals
1.Luster(shining)	They have metallic luster (are shiny).	They don't have metallic luster (not shiny).
2.Conductivity of heat	They are good conductors of heat.	They are bad conductors of heat.
3.Conductivity of electricity	They are good conductors of electricity.	They are bad conductors of electricity, except carbon (graphite).
4.The state at room temperature	They are solids except mercury (Hg) which is liquid.	They are solids, Liquids (bromine Br) and gases.
5.Malleability or hammering	They can be hammered to form sheets.	They can't be hammered.
6. No. of electrons in the outer most energy level	They contain 1, 2 or 3 electrons in the outermost energy level. (less than 4 electrons.)	They contain 5, 6 or 7 electrons in the outermost energy level. (more than 4 electrons).
7. Examples	Gold- Mercury- Aluminium	Sulphur - Oxygen- Bromine

Metals : They are the elements which contains 1,2 or 3 electrons in the outer mostenergy level.
Non-metals: They are the elements which contains 5, 6 or 7electrons in theoutermost energy level.

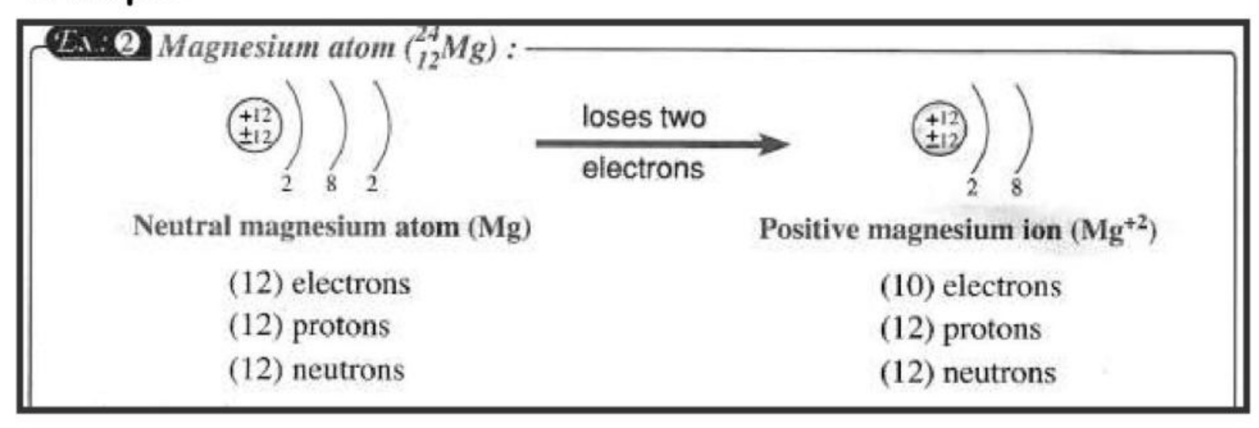
Metals and non-metals in the chemical reactions:

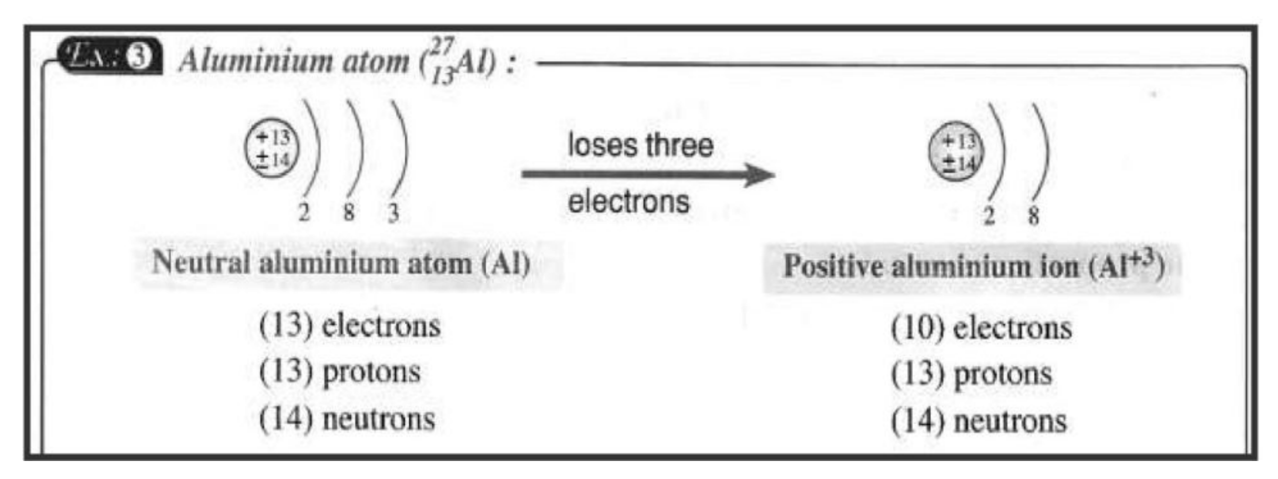
- **First: Metals**

➢ **In the chemical reactions:** Atoms of metals lose their outer electrons to other atoms of different elements & change into a ***positive ion*** with equal number of positive charges to the given electrons.

➢ ***A positive ion:*** is an atom that loses an electron or more during the chemical reaction.

Example:





Give reason:

When an atom loses an electron or more it becomes positive ion.

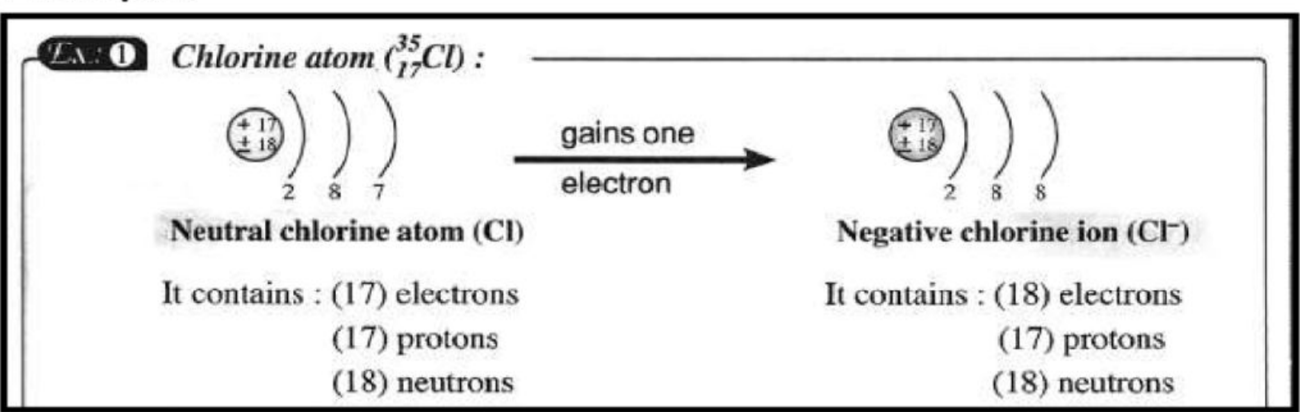
Because the number of positive protons becomes more than the number of negative electrons.

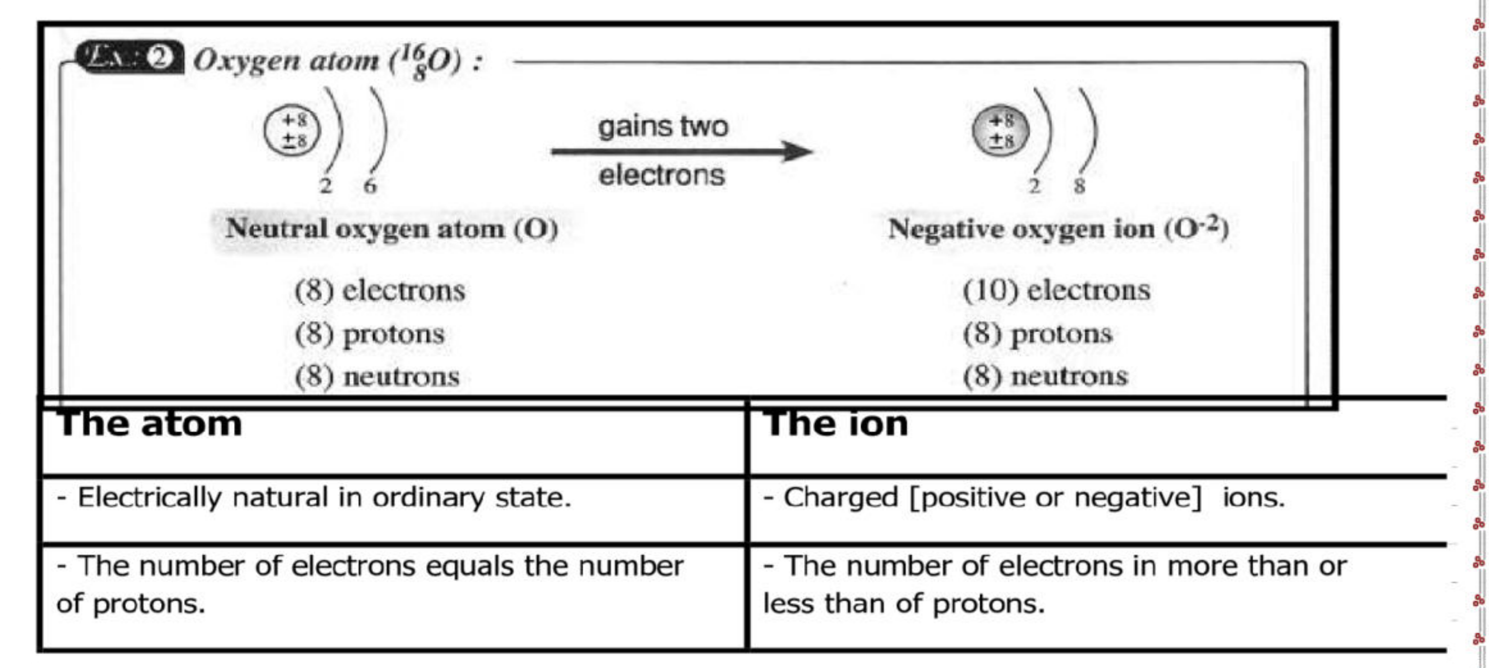
- **Second: Non-metals**

- **In the chemical reactions**: Atoms of non-metals gain electrons to fill their outer electron shell & change into **a negative ion**.

➢ ***A negative ion***: Is an atom gained an electron or more during the chemical reactions.

Example:





The atom	The ion
- Electrically natural in ordinary state.	- Charged [positive or negative] ions.
- The number of electrons equals the number of protons.	- The number of electrons in more than or less than of protons.

Third: Noble gases (Inert):

The outermost energy level filled with electron .

(Helium He – Neon Ne – Argon Ar – Krypton Kr – Xenon Xe – Radon Rn)

- They don't need a chemical combination with any other atom and don't form any ions in ordinary conditions.

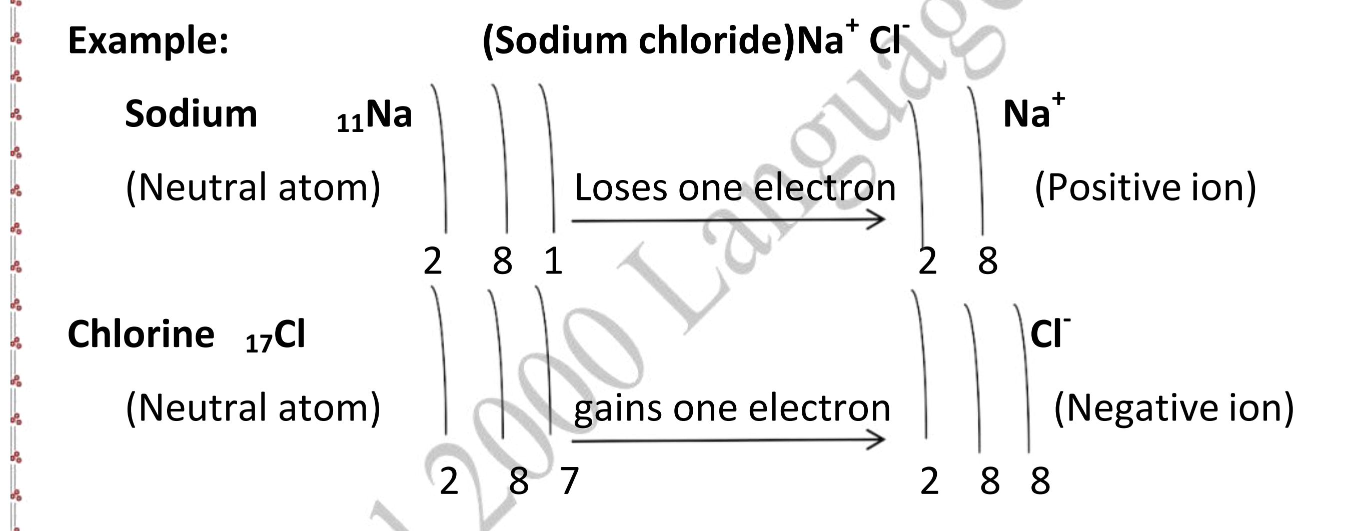
. Each molecule consists of one single atom (monoatomic).

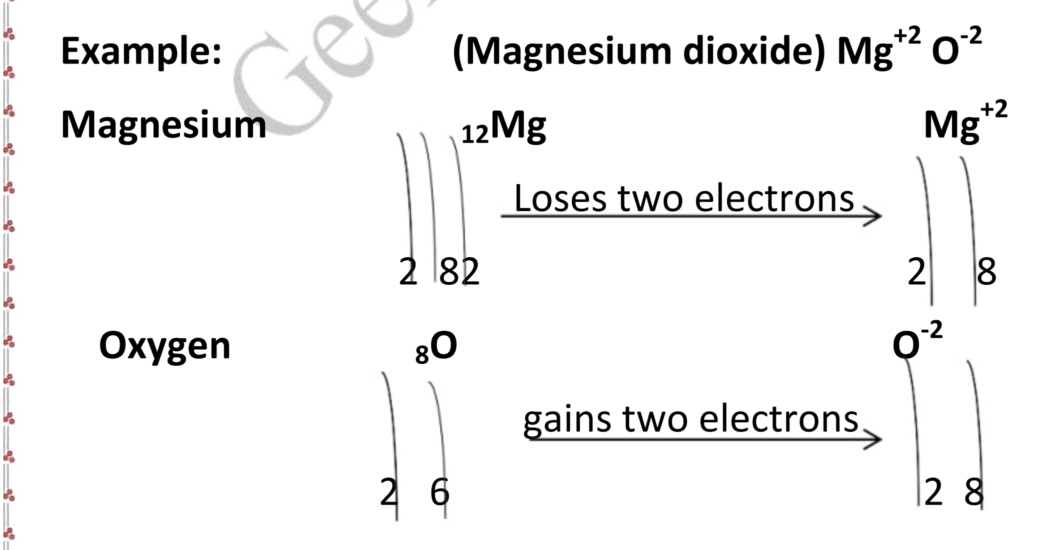
-Types of chemical bonds : Ionic bond and covalent bond

Ionic bond :

It is a bond resulting from the electric attraction between a positive ion and a negative ion.

It is combination between metal and non metal.





Give reason:

It is impossible to combine sodium and magnesium together to form a compound.

Because each of them is a metal, its atom tends to lose the outermost electrons during chemical reaction.

2- Covalent bond

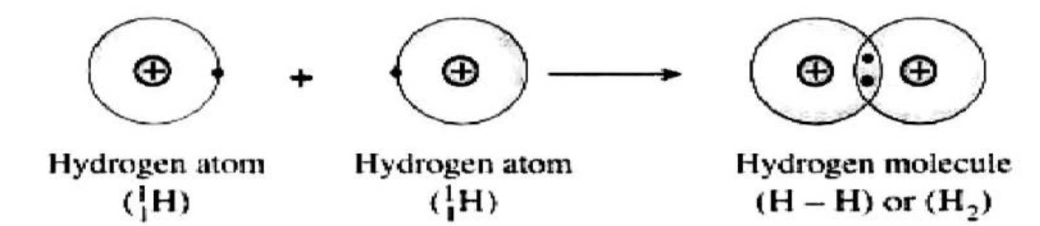
It is a chemical bond originated between the atoms of nonmetals through sharing (participation) of each atom with a number of electrons to complete the outer electron shell of each atom.

-The bond between two nonmetallic element producing elements molecules. Each atom shares other atom with the same number of electrons from its outer shell to fill their outer energy levels with electrons.

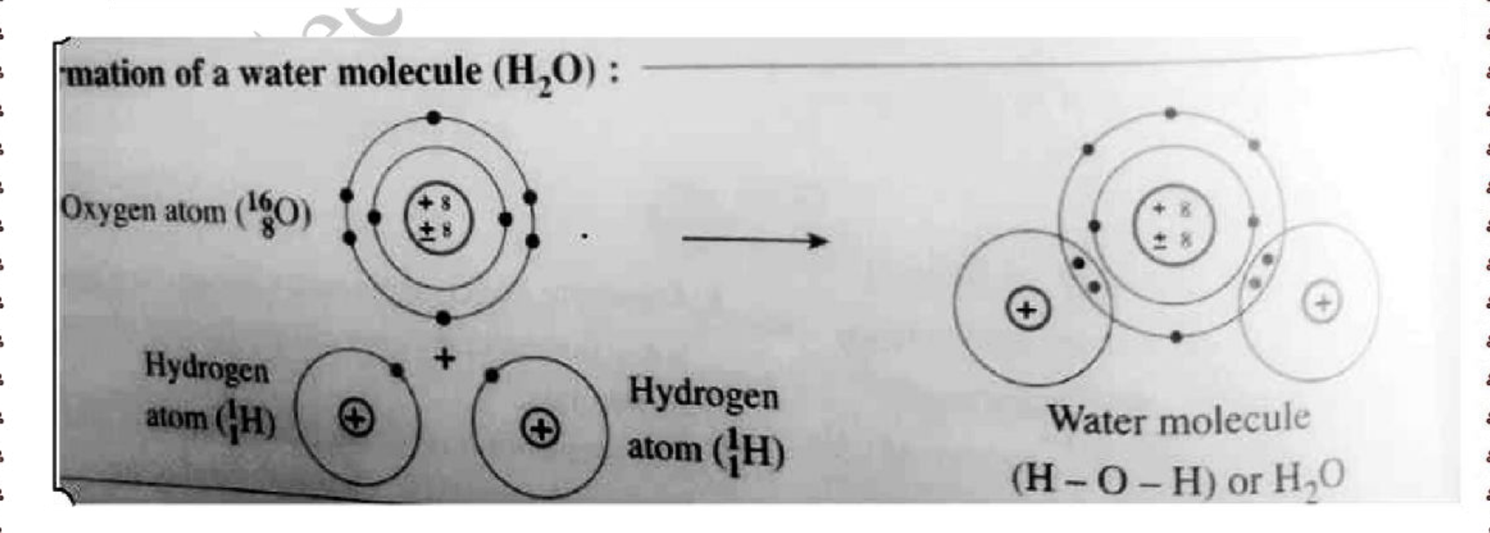
There are three types: single, double and triple covalent bond.

1-Single covalent bond: Each atom shares the other atom with one electron (-).

Example: **The formation of hydrogen H_2**

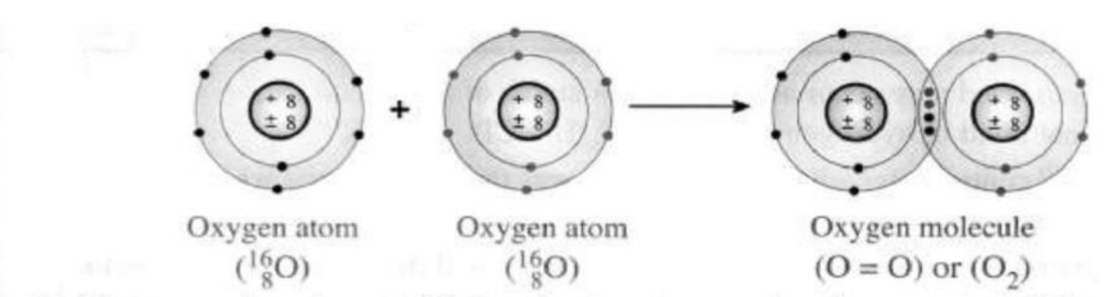


Each hydrogen atom shares with one electron to complete its outer shell (K level) with two electrons and becomes more stable.



2- <u>Double covalent compound:</u> It is bond which arises between two nonmetal atoms, where each atom shares the other atom with two electrons.

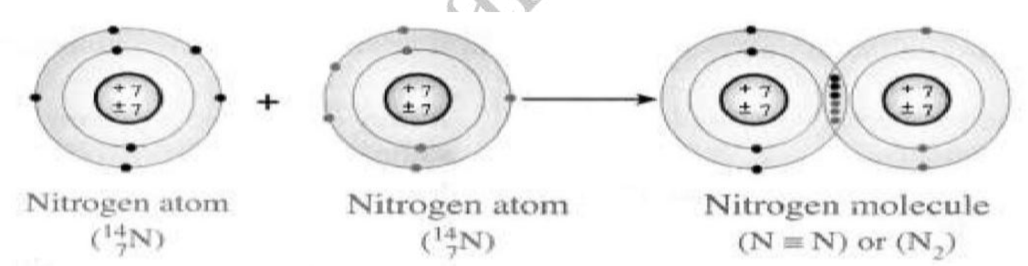
It is represented by two lines (=) joining the two atoms.



3- <u>Triple covalent bond:</u>

Each atom shares the other atom with three electrons (≡).

Example: **The formation of nitrogen gas N_2**



<u>Give reason:</u>

Ionic bonds produce compounds only not elements, but the covalent bonds produce both types an element or even a compound.

Because ionic bond arises between two different atoms (metal and non metal) as a result of electric attraction between the positive and negative ion ,while covalent bond arises between two similar or different nonmetal atoms .

Some important comparisons:

Positive ion	Negative ion
-A metallic atom that loses 1 electron or more during chemical reaction -It carries a number of positive charges equals to the number of the lost electrons. -The number of its electrons is less than the number of protons. -The number of its energy level is less than that of its atom.	-A non metallic atom that gains 1 electron or more during chemical reaction. - It carries a number of negative charges equals to the number of the gained electrons. - The number of its electrons is more than the number of protons. -The number of its energy level is equal to that of its atom.

An atom	An ion
*The smallest building unit of an element that can be shared in chemical reaction. *Neutral charged. *Its outermost energy level is not complete except atoms of noble gases. Number of electrons equals number of protons.	*An atom that gains or loses one electron or more during chemical reaction. *Charged (positive or negative ions). * Its outermost energy level is completely filled and similar to noble gases structure. * Number of electrons are not equal to number of protons.

Ionic bond	Covalent bond
It is formed by losing and gaining electrons. It arises between metal and nonmetal element. It produces compound molecules only. It has one type.	It is formed by sharing electrons. It arises between two nonmetal elements. It produces element and compound molecules. It has three types (single-double and triple).

Worksheet (1)

Complete:

1- Ionic bond arises between………………..and....................... elements.

2- During the formation of sodium chloride, chlorine atom .... one electron and changes into………………… while sodium atom ……………..one electron and changes into…………….

3- Atoms of…… ………….tend to lose an electron or more during the chemical reaction and changes into……………..

4- In the double covalent bond, each atom shares with… ....electrons such as in.......................molecule.

5- Covalent bond is formed among two…............... elements.

6- The types of covalent bonds are……………., …………….and…………

7- In………….element, the atoms don't lose or gain any electrons.

8- The number of electrons in oxygen ion is……………..electrons. Elements are classified according to their…………………and electronic structure into…………………,…………………and ………………….

9- All metals are……………………except………………which is a liquid.

10- Elements of………………….have luster, while elements of..................... don't have a luster.

11- Nonmetals have…………….than 4 electrons in their outermost energy level.

12- The negative ion carries a number of negative charges equal to the number of………………………………

13- Elements are classified according to their…………………and electronic structure into……………….,…………………and ………………….

14- All metals are……………………except………………which is a liquid.

15- Elements of…………………have luster, while elements of.................... don't have a luster.

16- Nonmetals have…………….than 4 electrons in their outermost energy level.

17- The negative ion carries a number of negative charges equal to the number of…………..

Q.2) Give reason:

1- The bond in the hydrogen molecule is a single covalent bond.

……………………………………………………………………………………

……………………………………………………………………………………

2- Both sodium ion and oxygen ion have the same number of electrons.

……………………………………………………………………………………

……………………………………………………………………………………

3- Noble gases don't participate in chemical reactions under the ordinary conditions.

……………………………………………………………………………………

……………………………………………………………………………………

4- Ionic bonds produce compounds only not elements, while the covalent compounds produce both of them.

……………………………………………………………………………………

…………………………………………………………………………………..

5- The bond in a molecule of magnesium oxide (MgO) is an ionic bond, where atomic number of Mg=12 and that of O=8.

……………………………………………………………………………………
……………………………………………………………………………………

6- When an atom gives an electron or more, it becomes a positive ion.
……………………………………………………………………………………
……………………………………………………………………………………

Q.3) **What is meant by:**

1- Metals.
……………………………………………………………………………………
……………………………………………………………………………… 2-..
Double covalent bond.
……………………………………………………………………………………
……………………………………………………………………………… 3-..
Nonmetals.
……………………………………………………………………………………
……………………………………………………………………………… 4-..
Noble gases.
……………………………………………………………………………………
……………………………………………………………………………………

4. Compare between ionic bond and covalent bond.

ionic bond	covalent bond
………………………………………	………………………………………
………………………………………	………………………………………
………………………………………	………………………………………

Lesson (2)

Chemical compounds

Valency:

It is the number of electrons that an atom gains, loses or even shares during a chemical reaction.

Element	Type	Valency
Lithium **Li** Potassium **K** Sodium **Na** Silver **Ag**	**Metallic elements**	**Monovalent (1)**
Hydrogen **H** Fluorine **F** Iodine **I** Bromine **Br** Chlorine **Cl**	**Nonmetallic elements**	**Monovalent (1)**
Calcium **Ca** Lead **Pb** Zinc **Zn** Magnesium **Mg** Mercury **Hg**	**Metallic elements**	**Divalent (2)**
Oxygen **O**	**Nonmetallic elements**	**Divalent (2)**
Aluminium **Al** Gold **Au**	**Metallic elements**	**Trivalent (3)**
Carbon **C**	**Nonmetallic element**	**Tetravalent (4)**

There are some elements which have more than one valency such as:

Element	Type	Valency
Copper cu	Metal	Copper monovalent Copper Divalent
Iron Fe	Metal	Iron (Ferrous Fe^{+2}) Divalent Iron (Ferric Fe^{+3}) trivalent
Sulphur S	Nonmetal	Divalent (2) Tetravalent (4) Hexavalent(6)
Nitrogen N	Nonmetal	Trivalent (3) Pentavalent (5)
Phosphorus P	Nonmetal	Trivalent (3) Pentavalent (5)

Give reason:

-Sodium ($_{11}$Na) is monovalent ,while oxygen ($_{8}$O) is divalent.

Because sodium atom loses one electron from its outermost shell to be stable, while oxygen gains or shares with two electron.

-The valency of nobel gases is zero.

Because their outer most shell is completely filled with electrons.

The Atomic Group (Radical)

It is a set of atoms of different elements joined together and behave like one atom during a chemical reaction, having its own valency and it is not existed solely (individually).

Atomic group	Symbol	Valency	Atomic group	Symbol	Valency
Hydroxide	OH^-	1	Sulphate	SO_4^{-2}	2
Nitrate	No^-_3	1	Carbonate	CO_3^{-2}	2
Bicarbonate	HCO^-_3	1	Phosphate	PO_4^{-3}	3
Ammonium	NH^+_4	1			
Nitrite	NO^-_2	1			

Give reason:

-Both nitrate and carbonate groups have the same number of atoms,but differ in their valencies.

Because nitrate group(No^-_3) consists of four atoms and it is monovalent group,while Carbonate (CO_3^{-2}) consists of four atoms and it is a divalent group.

-Both nitrite and nitrate groups differ in the number of atoms and having the same valency.

Because both are monovalent but nitrate (No^-_3) group consists of four atoms,while nitrite group (NO^-_2) consists of 3 atoms.

Chemical formula:

It is a formula that represents the numbers and types of the atoms in a molecule.

How to write the chemical formula for a compound?

1. Write the name of the compound in words.

2 .Write the symbol of each element or atomic group down to the name.

3. Write the valency down to each symbol.

4 .All the numbers are to be shortened as much as you can.

5.Replace the written numbers (You don't have to write the one (1)

6.In case of atomic atomic groups, if the number was not (1) put it between parenthesis and write the number right down to it.

Examples: **Sodium Chloride**

Na Cl

1 1 (NaCl)

Calcium oxide , Copper carbonate , Aluminium sulphate

Ca	O	Cu	Co_3	Al	SO_3
2	2	2	2	3	2
1	1	1	1	2	3

CaO $CuCo_3$ $Al_2(SO_4)_3$

Types of compounds according to their **properties**:

1) Acids 2) Bases (Alkalies) 3) Oxids 4) Salts

Acids: they are substances which dissociate in water producing positive hydrogen ions (H^+).

- **Properties of acids:**

1-They have a sour taste.

2- They change the color of blue litmus paper into red due to the presence of the positive hydrogen ions (H^+).

Chemical formula of mineral acids begins with hydrogen joined with one the negative atomic groups (except hydroxide OH -)

such as Sulphuric acid (H_2SO_4), Nitric acid HNO_3, Hydrogen may join some nonmetals like chlorine or bromine composing some compounds

such as Hydrochloric acid HCl and Hydrobromic acid HBr.

Examples:		
	Hydrochloride Acid	**HCl**
	Sulphuric Acid	**H_2SO_4**
	Nitric Acid	**HNO_3**

2.Bases

They are compounds that produce negative hydroxide ions(OH^-) when decomposed in water.

It's properties * Aqueous solutions of bases taste is bitter and feels slippery.

*It changes the colour of litmus to be blue due to the presence of (OH^-).

Examples:

Sodium Hydroxide (caustic soda) **Na OH**

Potassium Hydroxide **KOH**

Calcium Hydroxide (limewater) **$Ca(OH)_2$**

Oxids: Types are compounds resulted from the combination between oxygen and an element even though it is a metal or nonmetal.

Examples:

Metal oxides	Nonmetal oxides
Sodium oxide Na_2O	**Carbon dioxide CO_2**
Calcium oxide CaO	**Sulphur trioxide SO_3**
Aluminum oxide Al_2O_3	

4- Salts:

Are produced as a result of the chemical combination of a positive metal ion or a positive atomic group with a negative atomic group or a negative ion (except oxygen).

-Salts are existed in earth's crust or dissolved in water of seas and oceans.
***They are variant in taste, smell, colour, solubility in water and others.**

Salts are produced from the combination of

Positive metal ion

Negative Nonmetal ion	Negative atomic group
Ex:	EX:
Sodium chloride (table salt) NaCl Lead bromine $PbBr_2$	Sodium nitrate $NaNO_3$ Magnesium carbonate $MgCO_3$ Unhydrous copper sulphate $CuSO_4$

Positive atomic group

Negative nonmetal ion	Negative atomic group
Ex:	Ex:
Ammonium chloride NH_4Cl Ammonium bromide NH_4Br	Ammonium carbonate $(NH_4)_2CO_3$ Ammonium nitrate NH_4NO_3

Salts are classified according to solubility in water into:

Salts soluble in water	Salts insoluble in water
• Sodium chloride Table salt (NaCl). • Potassium Sulphate (K_2SO_4). • Calcium Nitrate $Ca(NO_3)_2$. • Sodium Sulphide (Na_2S).	• Silver Chloride (AgCl). • Lead iodide (PbI_2). • Lead Sulphate ($PbSO_4$).

Note:

All of carbonate salts don't dissolve in water except sodium carbonate, potassium carbonate and ammonium carbonate.

Some important Comparison

An atom	An ion
*The smallest building unit of an element that can be shared in chemical reaction. *Neutral charged. *Its outermost energy level is not complete except atoms of noble gases. Number of electrons equals number of protons.	*An atom that gains or loses one electron or more during chemical reaction. *Charged (positive or negative ions). * Its outermost energy level is completely filled and similar to noble gases structure. * Number of electrons are not equal to number of protons.

Acids	Bases
1. They are substances which dissociate in water producing hydrogen ions $(H)^+$	- They are substances which dissociate in water producing hydroxide ions $(OH)^-$
2. The symbol of all the mineral acids begins with hydrogen (H).	- The symbol of all alkalis ends with (OH) group.
3. They have a sour taste.	- They have a bitter taste.
4. They change the colour of litmus paper to be red due to the presence of hydrogen ions $(H)^+$	- They change the colour of litmus paper to be blue due to the presence of hydroxide ions $(OH)^-$.
Ex.: H_2SO_4 & HCl	Ex.: NaOH & $Ca(OH)_2$

Worksheet (2)

Q.1) Write the scientific term:

1- The number of electrons gained, lost or even shared by an atom during a chemical reaction. (… ....)
2- A formula represents the number and types of atoms in a molecule. (…………………..…)
3- They are compounds resulted from the combination between oxygen and an element even through it is metal or nonmetal. (… ....)
4- Substances are dissociated in water producing negative hydroxide ions. (……………………..)
5- A set of atoms joined together, behave like one atom only, having a special valency and can't be existed solely. (….............................)
6- They are substances which dissociate in water producing positive hydrogen ion. (… ....)

Q.2) Complete:

1- The valency of iron is…………….in ferrous chloride, while in ferric chloride is……………..

2- Some nonmetallic elements have more than one valency such as …………………and…………………

3- Phosphorous element has two valences which are……….and………………..

4- The atomic group is a set of atoms of different elements jointed together acts as………………during chemical reactions and has its own ………………

5- The valency of carbonate group is………………..while that of bicarbonate group is…………………..

6- On dissolving in water, acids give……………………ion, while bases gives …………..ions.

7- The chemical formula of a magnesium sulphate is…......................while that of calcium nitrate is…………………

8- Compounds are classified according to their properties into................, ……………., ………………and…………………

9- Acids turn litmus paper to ………………due to the presence of ....Ion, while bases turn litmus paper to........................due to the presence of....................ion.

10-We can use……………….to distinguish between acids and bases.

11-Salts are variant in some of their properties such as…................ , …………….., ……………………and………………

Q.3) Give reasons:

1- The valency of noble gases is zero.

…………………………………………………………………………………………..
………………………………………………………………………………………………

2- The chemical formula of sodium carbonate is (Na_2CO_3).

………………………………………………………………………………………………
….……………………………………………………………………………………………

3- Both nitrate and carbonate groups have the same number of atoms but differ in their valencies.

………………………………………………………………………………………………
…………………………………………………………………………………………

Q.3) Write the chemical formula of the following compounds:

1- Copper nitrate:……………………………………………………………………
2- Sodium carbonate:………………………………………………………………..
3- Aluminum oxide:……………………………………………………………………
4- Table salt: …..………………………………………………………………………
5- Potassium chloride: …………………………………………………………………
6- Silver nitrate: …………….……………………………………………………..

Lesson (3)

Chemical equations & chemical reaction

Chemical reaction:

It is the breaking of the existing bonds between the atoms of the molecules in the reactants and forming new bonds between the atoms of the molecules in the products.

Chemical equation:

It is a set of symbols and chemical formula representing the reactants and products molecules in the chemical reaction and it represents the conditions of the reaction.

- Chemical equation may be **word equation** or **symbolic equation**.

For example:

Word equation: **Magnesium + Oxygen $\xrightarrow{\Delta}$ Magnesium oxide**

Symbolic equation: $2Mg + O_2 \xrightarrow{\Delta} 2MgO$

Note:

Reactants: they are substances that take part in the reaction.

Products: they are substances that are formed at the end of the reaction.

The chemical equation must be balanced that means the number of reactant atoms of an element should be equivalent to the number of its atoms produced from the reaction.

. Ex:

How to balance this equation?

$H_2 + O_2 \longrightarrow H_2O$ **(Not balanced)**

Solution: $2H_2 + O_2 \longrightarrow 2H_2O$ **(Balanced)**

The balanced chemical equation

It is an equation in which the number of atoms entering a reaction equals the Number of atoms resulting from this reaction.

Law of chemical combination:

a) Law of conservation of matter (mass). **b) Law of constant ratios.**

a) Law of conservation of matter (mass).

The sum of reactants masses in any chemical reaction equals the sum of products masses.

i.e. the total amount of the reactant masses = the total amount of the product masses.

Example: Achieving the law of conservation of matter in the reaction o magnesium with oxygen .(atomic mass of Mg=24 , O=16)

$$2Mg + O_2 \longrightarrow 2MgO$$

(24 x 2) + (2x16) 2(16+24)

48+ 32 2(16+24)

80 gm 80 gm

The total amount of reactants masses is equal to the total amount of products masses.

Ex:

Express the equation of Hydrogen gas when it reacts with Chlorine gas formingn hydrogen chloride and achieving the law of conservation of matter.

(atomic mass of : H=1 & Cl=35.5)

Solution:

Word equation: Hydrogen +Chlorine ⟶ Hydrogen chloride

Symbolic equation: $H_2 + Cl_2 \longrightarrow 2HCl$

(2 x1) + (2 x 35.5) ⟶ 2(1+ 35.5)

73 73

The sum of reactants masses= The sum of products masses which achieves the law of conservation of matter.

Law of constant ratios:

The chemical compound is formed from combination of atoms of two or more elements by constant weight ratios.

Types of direct combination reactions

1- Element with element

1- **(two non-metals):**

Carbon + Oxygen $\xrightarrow{\triangle}$ carbon dioxide

$$C + O_2 \xrightarrow{\triangle} CO_2$$

Hydrogen + Chloride ⟶ Hydrogen chloride

$$H_2 + Cl_2 \longrightarrow 2\,HCl$$

2- **(Metal& non-metal):**

Magnesium + Oxygen $\xrightarrow{\triangle}$ Magnesium oxide

$$2\,Mg + O_2 \xrightarrow{\triangle} 2\,MgO$$

3- **Element + Compound**

- Oxygen + carbon monoxide ⟶ carbon dioxide

$$O_2 + 2\,CO \longrightarrow 2CO_2$$

- Nitrogen monoxide +oxygen ⟶ Nitrogen dioxide

$$2\,NO + O_2 \longrightarrow 2\,NO_2$$

4. A compound with another compound:

White clouds are formed when we place a glass rod wet with conc.hydrochloric acid close to ammonia solution.

$$NH_3 + HCl \xrightarrow{Conc.} NH_4Cl \text{ (white clouds)}$$

What happens when:

Approaching a wet rod with hydrochloric acid to ammonia gas.

White clouds of ammonium chloride are formed

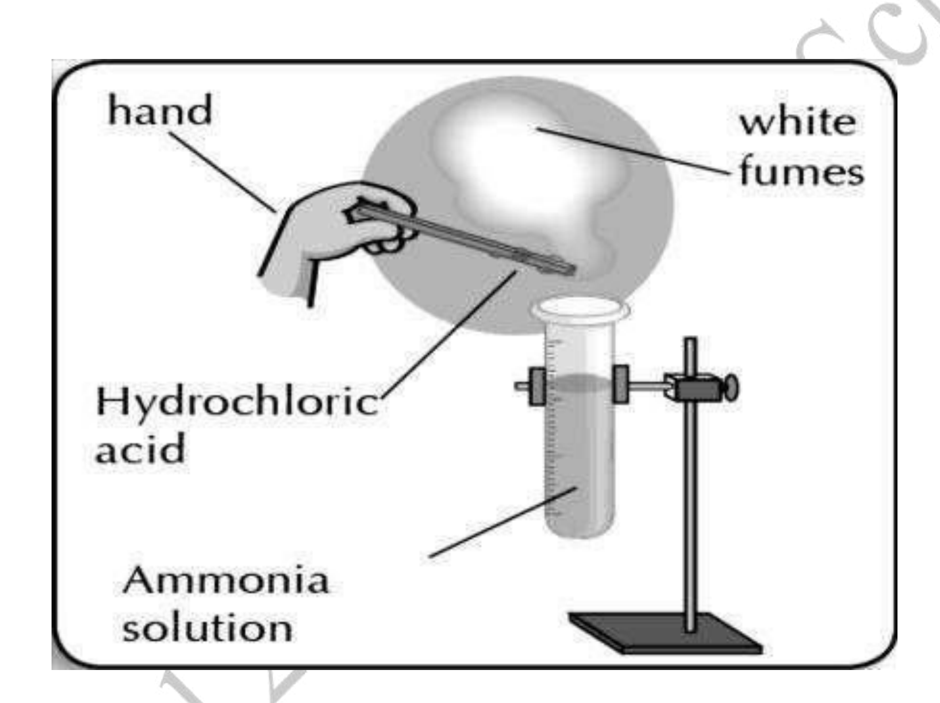
$$NH_3 + HCl \xrightarrow{Conc.} NH_4Cl \text{ (white clouds)}$$

Give reason:

White clouds are formed when ammonia gas reacts with conc. Hydrochloric aci

Due to the formation of ammonium chloride as white clouds

$$NH_3 + HCl \xrightarrow{Conc.} NH_4Cl \text{ (white clouds)}$$



Chemical reactions in our life:

- Chemical reactions are used in many industries as medicines, fertilizers, fuel, plastics,car batteries,food & others.

- Chemical reactions also have **negative effects** as environmental pollution such as:

1- **Burning of coal & Cellulose fibers**

Such as burning paper and cigarettes cause air pollution and lung cancer.

2 - Fuel burning:

- Produces **Carbon dioxide (CO_2)** which:
  - Increases the atmospheric temperature (greenhouse effect).
  - Permits the penetration of thermal rays from the sun & never let them back.
- **Carbon monoxide (CO):** causes headache, fainting, and stomach aches & may lead to death.

- **Sulphur oxides:**

  Sulphur dioxide (SO_2) and

  Sulphur trioxide (SO_3)



They are acidic gases causing respiratory systems malfunction (breathing problems) & building corrosion.

- **Nitrogen oxides**:

which resulted from fuel burning during lightning

they are poisonous acidic gases & affect the nervous system and the eye.



Worksheet (3)

Q.1) Complete:

1- The chemical equation is a set of………………and…………………
expressing the reactants and…………………in the chemical reaction.
2- Burning of coal and cellulose fibers causes…………..and ……………
3- $C + O_2 \xrightarrow{\Delta}$ ………………….
4- Sulphur oxides such as………………and…………………..are acidic gases which cause…………………and………………….
5- Combination of carbon with oxygen gives……………………..gas and this reaction is considered…................... reaction.

Q.2) What is meant by :

- Chemical reaction:

……………………………………………………………………………………
……………………………………………………………………………………

- Chemical equation

……………………………………………………………………………………
……………………………………………………………………………………

- Law of constant ratios

……………………………………………………………………………………
……………………………………………………………………………………
.

Q.3) Put (√) or (X) and correct the wrong ones:

1-Burning of cigarettes causes' lung cancer. ( )
2- By increasing the ratio of carbon dioxide, the air temperature decreases. ( )
3- Silver chloride salt is soluble in water. ( )
4- In the chemical reaction, the bonds of reactants and products are broken. ( )
5- When ammonia gas reacts with hydrochloric acid, white fumes of ammonium chloride are formed. ( )
6- Burning fuels produce harmful gases which lead to dangerous effect on environment and human being. ( )

Q.4) Calculate the masses of reactants and products in the following reaction: $S + O_2 \longrightarrow SO_2$

Knowing that the mass of (S= 32 gm, O = 16 gm)

Unit Two
Force and motion

Lesson 1: Fundamental forces in nature.

Force:
Is an effect attempts to change the object's state from being static to motion or vice versa or attempts to change the direction of motion.
Measuring unit of force is (Newton)

Fundamental forces in nature:

- Gravitational forces.
- Electromagnetic forces.
- Nuclear forces (Strong and weak forces).

First: Gravitational forces

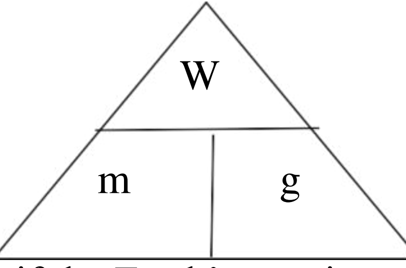
Object Weight

It the ability of the Earth to attract that object to its center
Or It is the force of Earth's gravitational to the object .

Object's weight (w) = object's mass (m) x Earth's gravity acceleration (g)

$$W = m \times g$$

So, weight depends on: 1- object's mass
2- Gravitational acceleration



Example (1):
Calculate the weight of an object if its mass is 100 Kg if the Earth's gravity acceleration is 9.8 m/s^2

Solution: Mass = 100 Kg g = 9.8 m/s2 W= ??
W = m x g = 100 x 9.8 = 980 Newton

2) Find the mass of an object its weight=50Newton knowing that the earth's gravity acceleration is 9.8m/sec^2.

Weight= object's mass (m) x Earth's gravity acceleration (g)

$$W = m \times g$$

$$m = w/g$$

$$m = 50/9.8 = 5.102\text{Kg}$$

3) Find the earth's gravity acceleration of a body whose weight is 980Newton knowing that the mass is 100Kg.

$$W = m \times g$$

$$g = w/m$$

$$g = 980/100 = 9.8\text{m/sec}^2$$

Give reason:

1- **The weight of the object at the South Pole is greater than its weight at the equator.**
   Because the earth's gravitational acceleration at the South Pole is greater that the Earth's acceleration at the equator.
2- **The weight of the object is always more than its mass.**
   Because it equals multiplying the mass of the object by Earth's gravitational acceleration.

Notes:

- The weight is a changed value, while the mass is constant.
- By increasing the mass the weight increase.
- Isaac Newton was the first one who discovered the Earth's gravity

-There is a direct relationship between weight and earth's gravity acceleration, weight and mass.

-There is an inversely proportional relationship between mass and earth's gravity acceleration.

***Object's centre of gravity**: It is the point at the centre of an object where the force of gravity affects the object.

Second: Electromagnetic forces

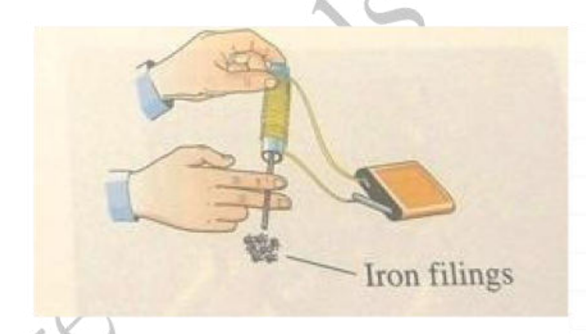
Activity:

Tools: scissors- a long insulated copper wire- a soft iron bar or an iron nail- a dry battery (about 4.5volts)-iron filings-two open ended plastic tubes.

Steps:

1.Coil the wire in a spiral form tube around the plastic tube.

2.Insert the iron bar or the iron nail in the tube, and connect the two ends of the wire with the battery then approach the core inside the tube to the iron filings.



Observation:

Iron bar attracts the iron filings and when the electric current cut iron filings leave the nail.

Conclusion: Electric current has a magnetic effect.

Application on electromagnetic forces:

Electromagnet , electric generator and electric motor

Electromagnet :

It is made up of an insulated copper wire coiling around a bar of soft iron, and when an electric current passes through, it works as a magnet.

It's uses: * Cranes which lift scrap iron and cars in ports.

* Making the electric bells.

Electric generators (dynamo) and electric motors depend on electromagnetic forces to work.

Points of comparison	Electric generators	electric motors
Idea of work	Changes mechanical energy into electric energy.	Changes electric energy into mechanical energy.
Examples	Dynamo	The motor in the fan-blender (mixer).

Third: Nuclear forces

- Scientists have discovered that the atom stores a massive amount of energy inside its nucleus.
The massive energy is followed (accompanied) by forces known as nuclear forces which can be divided into:

- **Weak nuclear forces**:
- They are used to get radioactive elements and radiations.
- Used in medicine& scientific researches and industry.

- **Strong nuclear forces:**
- These nuclear forces liberate nuclear energy.
- Used in military purposes and produce electric energy

Note: Egypt seeks to use nuclear energy in producing electricity besides the other forms of energy.

Worksheet (4)

1-Complete:

1- Force can change the……………………….of motion of an object.

2- The measuring unit of the object's mass is……………………while that of its weight is………………………

3- The idea of how the electromagnet works is to change.......................to change into……………………….

4- Weak nuclear forces are used in……………………………..

5- Egypt seeks to use……………………energy in producing electricity.

6- Object's center of gravity is the point at the center of the object at which the force of ....affects it.

7- The electromagnet is made up of an isolated............................wire coiling around a bar of……………………

8- Fundamental forces in nature are divided into …………, ………..and ....

Q.1) Choose the correct answer:

1.If the object's mass is 10Kg and the Earth's gravity acceleration is $10m/s^2$, so the object's weight equal …………

a.20Newton b.1 Newton c.100 Newton d.50 Newton

2.All of the following are caused by force except…………..

a.moving objects b.change object direction

c.changing mass d.increase object's speed

3.When an object's mass increases to the double, then its weight……….

a.decreases to half b.is doubled

c.remains constant d.no correct answer

4.The weight of an object changes by changing the………………of the object.

a.speed b.mass and position c.type d.all the previous

5.Earth's gravity acceleration ………………at the poles.

a.increases b.decreases c.remains constant d.no correct answer

6 ....force is used in making atomic bombs.

a.Electromagnetic b.Gravity

c.Weak nuclear d.Strong nuclear

Q.2) Write the scientific term:

1- A clean source of energy produced from strong nuclear forces. (…………………..)
2- The effect that attempts to change the object's phase from being static to motion or vice versa or attempts to change the motion direction. (………………..)
3- The ability of the earth to attract an object to its center. (…………………..)
4- An instrument used to change the electric energy into magnetic energy. (…..............................)
5- An instrument used in making electric winches and electric bells. (……………………..)

Q.3) Give reason:

1.The direction of a moving ball changes by kicking it with your head.

……………………………………………………………………………………
……………………………………………………………………………………

2.Object's mass remains constant regardless of changing their place on Earth's surface

……………………………………………………………………………………
……………………………………………………………………………………

3.Gravity acceleration changes on Earth's surface from one place to another.

……

……

Q.4) What happens if:

1.A force effects on a static object.

……………………………………………………………………………………………………

2.A force effects on a moving object.

………………………………………………………………………………………………

3.Moving away from the earth center (concerning mass and weight).

……………………………………………………………………………………………………

4.Passing electric current in a copper coil around bar.

……

5.Cutting off the electric current from electromagnet attracting iron filings.

……

6.Using electric motor in a lot of sets as fan and blender.

……

Q.5) What is meant by:

1-Force:

……………………………………………………………………………………………

2-Weight:

……………………………………………………………………………………………………

Q.6) Problems:

1.Find the weight of an object its mass is 500 gm knowing that the Earth's gravity acceleration is 9.8 m/sec^2.

2.Find the Earth's gravity acceleration for a body whose weight is 98 Newton knowing that its mass is 10 Kg.

3.By knowing that Earth's gravity acceleration in a place is 10 m/s^2 calculate:

a.An object's mass if its weight is 100 Newton.

b.An object's weight if its mass is 20 gram.

Q.7) Compare between each pair of the following:

1. Mass and Weight

Mass	Weight

3- Electric generator and Electric motor.

Electric generator	Electric motor.

Lesson 2
Accompanied forces with motion

Accompanied forces to motion

- Forces originate due to motion
  - Inertia
  - friction force
- forces cause motion
  - forces inside living systems

Force of inertia

It is a property of an object to resist the change of its phase from rest to motion in a regular speed and in a straight line unless an external force acted upon it.

Safety belts and inertia forces:

They work on stopping the forces of inertia not to injure (hurt) the car or plane passengers when a sudden change in motion occurs.

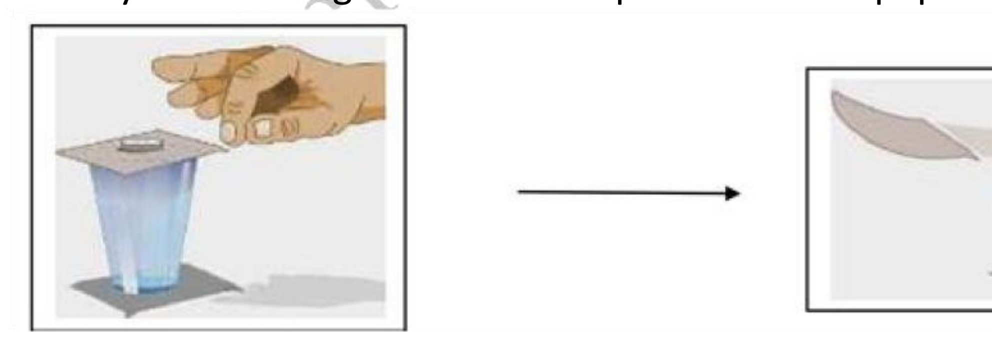
Activity:

Tools: Piece of cardboard paper-glass cup-coin

Steps:

1.Place a piece of cardboard paper on the top of a glass cup and put a coin on it.

2.Use your fore finger to deliver a quick hit to the paper.



Observation:

The paper will go away from the cup while the coin falls inside the cup.

Conclusion:

The static object resists its motion as your finger's hit was at a high speed that the coin can't match up with your finger's rapid hit due to its inertia and resistance to the sudden movement so it remains static then it fall in the cup.

Friction forces:

They are resistant forces (against motion) originated between the object in motion and the medium touching it.

Benefits of friction:

-Prevent slipping during walking.
-Helps in stopping and starting the motion of cars.
-Helps in burning of matches.

Harms of friction:

- Loss of mechanical energy because mechanical energy changes to heat.
- It produces heat energy due to the friction between some parts of the machines this heat expansion these parts and affects their performance.
- Erosion of machines parts and damages them.

Give reason:

1- Cars tires are covered with a very coarse substance.

To increase friction between tires and the road to help car in starting motion and stopping.

2- Lubricating and oiling mechanical machines.
To reduce friction between moving parts of machines and prevent their erosion.

3. Car tires are covered with a very coarse substance.

To increase the friction force between the tires and the road to facilitate the starting and stopping of the car.

forces inside living systems (biological forces):

Biological forces:

There are forces inside living systems enable living organisms to do their different biological operations.

Such as:

- Heart muscles contraction and relaxation.
  (helps the heart to pump blood to all body parts).
- Pulse inside the blood vessels.
- Liquids transport through pores and the wall of the cells from low Concentration to the higher one.
- The contraction and relaxation of muscles.
  To help the body organs movement
- Rising of water and salts from the soil to plant (from root to stem ,then leaves) against earth's gravity force.

Note:

- The role of the heart in raising blood is similar to the role of water pump.
- Forces inside living systems :
  1- Simple systems are uni-cellular living organism.
  2- Complex systems such as multi-cellular living organism.

Worksheet (5)

Q.1-Write the scientific term:

1.It is a property of an object to change its phase from rest to motion. ( )

2.Technological application used in cars to prevent the force of inertia when a sudden change in motion occurs. ( )

3.Forces that help living organisms ( )

4.Substances that are used for decreasing the friction force among the internal moving parts of a machine. ( )

5.Force that helps in moving and stopping cars. ( )

Q.2-Complete the following sentences:

1……………..is from the force that causes the movement of objects.

2.Inertia force effects on…………….and ....objects.

3.Bus passengers are rushed ……………when the bus suddenly stops, due to the………………

4.Friction force is.............. a force that originates between body and surface.

5 .... is used between the internal moving parts of machines to decrease friction force.

6-……………..and…............ of heart muscle helps in pumping the blood all over the body organs.

7.Liquids transfer through the wall of the cells from the...........concentration to the…..........concentration.

Q.3-Choose the correct answer:

1.From the accompanied forces with motion is/ are…………….

a.inertia force b.friction force

c.force inside the living systems d.all the previous answers

2.Static objects resist the change of its …………..from rest to motion.

a.mass b.density c.movement d.all the previous answers

3.The falling of a coin in the cup by a rapid hitting is an application on….

a.inertia b.friction

c.force inside the living systems d.all the previous answers

4.Friction force originates between……………..

a.bodies and water b.body and air

c.during motion d.all the previous answers

5.Car tires are covered with a very… .... substance.

a.smooth b.hard c.coarse d.All the previous answers

6.The force that helps living organisms to do their biological operations is……….

a.inertia bfriction

c.force inside living system d.All the previous answers

7.Water is transported from the soil to leaves of the plant by the effect of… .... force.

a.gravity b.inertia c.inside living system d.friction

Q.4-Give reason for:

1.Falling of a coin in the cup by a rapid hitting of the paper.

…………………………………………………………………………………………
…………………………………………………………………………………………

2.The rider of the bike is rushed forward when he stops suddenly.

…………………………………………………………………………………………

…………………………………………………………………………………………

3.If a car is at rest, passengers are rushed backwards when the car moves suddenly.

…………………………………………………………………………………………

…………………………………………………………………………………………

4.The policeman advice the drivers to use safety belts in cars.

…………………………………………………………………………………………

…………………………………………………………………………………………

5.The car and train have streamline shape.

…………………………………………………………………………………………

…………………………………………………………………………………………

6.Car tires are covered with grooves.

…………………………………………………………………………………………

…………………………………………………………………………………………

7.Body muscles contract and relax.

…………………………………………………………………………………………

…………………………………………………………………………………………

8.Corrosion of gears in the mechanical machines.

…………………………………………………………………………………………

…………………………………………………………………………………………

<u>Q.5-What happens if:</u>

1.You hit quickly a paper placed over a glass cup and a coin placed over the paper.

…………………………………………………………………………………………

…………………………………………………………………………………………

2.A moving car stop suddenly (concerning the passengers).

…………………………………………………………………………………………

3.The passengers don't use the safety belts in cars and planes.

……………………………………………………………………………………

4.The matches touch a rough surface.

……………………………………………………………………………………

5.Stopping lubricating and oiling of internal moving parts of a machine.

……………………………………………………………………………………

6.Body muscles don't contract and relax.

…………………………………………………………………………………………

Q.6-Mention one use for:

1.Inertia force.

……………………………………………………………………………………

2.Friction force.

……………………………………………………………………………………

3.Biological force.

…………………………………………………………………………………………

Lesson (3) Motion

The speed:

*It is the distance covered by an object in a unit of time.

*Measuring units of speed is (m /sec) or (Km/hour).

Relative motion:

It is the change in an object position or direction as time passes relative to another object or a fixed point known as a frame of reference.

The reference point:

It is a fixed point used to determine the object's position or to describe its movement.

Types of motion:

1- Periodic motion:

- It is a motion which is regularly repeated in equal periods of time.
- It doesn't have initial or final position

Examples:

- Vibrating motion: as in the simple pendulum.
- Circular motion: movement of moon around earth
  as a fan arm while it is on.
- Wave motion: Water waves as when a piece of cork is thrown in water.

2- Transitional motion:

- It is a motion in which the object's position is changed relative to a fixed point from time to time.
- It has initial & final position.

Examples:

- Train or car motion .
- person's motion .
- Bike motion .

Waves causing wave motion are :

Mechanical waves and electromagnetic waves.

Mechanical waves	Electromagnetic waves
1. They are waves that need a medium to transfer through.	1. They are waves accompanied by electromagnetic forces and they don't need a medium to transfer through.
2. They are produced by the vibration of the medium particles.	2. They spread in all media and space.
3. Their speed is relatively low. (speed of sound is about 340 m/s).	3. Their speed is very high (speed of light is about 300 million m/s
Examples: (Sound waves - Water waves).	Examples: (Light waves - X-ray – ultraviolet rays- Radio and TV waves - Gamma rays- microwaves-Wireless wave - U.V ray - Infrared rays).

Give reasons:

1-Although the thunder& lightning happens at the same time raining, we see lightning before hearing thunder.

Because the light of lightning is from electromagnetic waves while the sound of thunder is from mechanical waves and the speed of electromagnetic waves is much greater than the speed of mechanical waves.

2- We receive the sun light but we don't hear the sound of solar explosions.

Because the light is electromagnetic wave that doesn't need a medium t transfer through , but sound is a mechanical wave that needs a medium to travel through .

Some technological applications for sound Mechanical waves :

- Examining and curing sets for human body using sound waves (ultrasonic waves).
- Stringed musical instruments as violin, lute and guitar.
- Pneumatic musical instruments such as: flute or reed pipe.
- Amplifiers and devices of distributing and controlling sound's sets used in broadcasting.

Some technological applications of electromagnetic waves:

1-Visible light (Seen):

Photographic cameras - T.V cameras - light show (data show).

2-X- rays:

Detecting the bone fracture – examining mineral raw in industry (to show errors, pores and cracks) and studying the inner structure of mineral crystals.

3-Gamma rays:

Medical purposes as the treatment & discovering some swellings (tumors).

4-Ultraviolet rays (UV):

To sterilize the sets of surgical operations rooms

5-Infrared rays (IR):

- Cooking food as they have heat effect.
- In remote sets to control electric sets.
- Remote sensing instrument to photograph earth surface using satellites.
- Night vision sets in military

Note:

- The ultraviolet rays ,X-rays and gamma rays are used in medical purposes.
- Infrared rays and visible light are used in photography.

Worksheet (6)

Q.1) Complete:

1- The waves causing the wave motion are divided into two types which are ………………….and .... waves.

2- Relative motion is the change in an object… ....or ………………………as the time passes relative to another object or fixed point known as………………….

3- The motion of simple pendulum is known as………………motion, while that is produced from throwing a stone in water is known as..............motion.

4- Electromagnetic waves are accompanied by… .... forces.

5- Thunder sound transfers in a form of............................waves, whereas lightning flash transfers in a form of................................waves.

6- …………………..rays are used in sterilizing the sets of surgical operation rooms, while……………………rays are used in discovering some swellings.

7- Infrared rays are used in cooking food because they have… .... effect property.

Q.2) Give reasons:

1- Gamma rays have medical purposes.

…………………………………………………………………………………………

…………………………………………………………………………………………

2- The motion of the simple pendulum is a periodic motion.

…………………………………………………………………………………………

…………………………………………………………………………………………

3- A train motion is a translational motion.

…………………………………………………………………………………………

…………………………………………………………………………………………

4- Sound and water waves are mechanical waves.

……………………………………………………………………………………………

……………………………………………………………………………………………

Q.3) What is meant by?

1- Relative motion:

……………………………………………………………………………………………

……………………………………………………………………………………………

2- Periodic motion:

……………………………………………………………………………………………

……………………………………………………………………………………………

3- Translational motion:

……………………………………………………………………………………………

……………………………………………………………………………………………

4- Speed:

……………………………………………………………………………………………

……………………………………………………………………………………………

Unit three

Lesson 1

The celestial bodies

Celestial bodies : They are bodies swim in space such as stars, planets, moons and rocky or gaseous bodies rotate in space.

Stars : They are big sized bodies that emit enormous amounts of heat and light.
Astronomers don't measure the distances between stars by kilometers. But with **light year** Because the distances between them are very large.

Light year :

It is the distance covered by light in one year and it equals 9.467×10^{12} km.

Distance in light year = Distance in km / 9.467×10^{12}

Galaxies:

-They are the greatest units that form the universe.
- They are a tremendous collection of star.
- They are a system that consists of thousands of millions of stars.

The galaxy of our solar system is "**The milky way or the way of chopped hay.**"

It takes an **oval shape** with coiled **spiral arms**, the sun lies on one of these spiral arms.

The components of the solar system

sun - 8 Planets - Moons - Celestial bodies (Meteors - Meteorites - Asteroids - Comets).

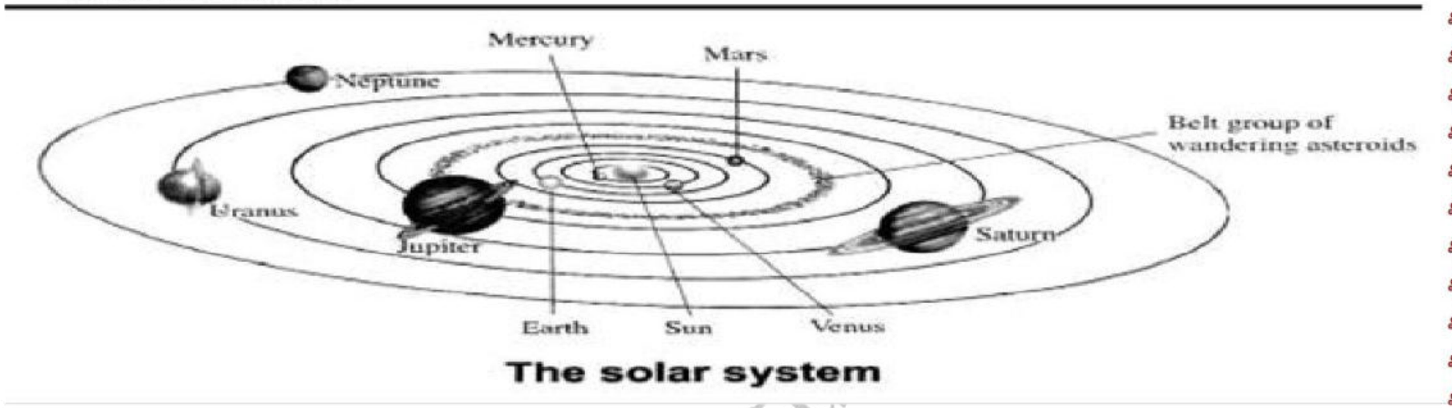
The sun:

It is the star of our solar system.
It is the biggest body in the solar system.

It lies at the center of solar system and other bodies of the solar system revolve around it.

▪ Planets:

- ❖ They are 8 spherical opaque bodies revolve around the sun in one direction (anti clockwise) in a semi-circular or elliptical path (oval paths).
- ❖ These paths lie in one plane perpendicular to the sun's axis of rota around itself.



The solar system

Arrangement of planets:

1- According to their distances from the sun(nearest to farthest).

Mercury – Venus-Earth- Mars- Jupiter-Saturn- Uranus –Neptune

2- According to their sizes (biggest to smallest).

Jupiter- Saturn- Uranus –Neptune- Earth- Venus- Mars- Mercury.

Notes:

-The Earth planet has the highest density.

- Mercury is the nearest planet to the sun,while Neptune is the farthest one.

- Jupiter is the biggest planet in solar system,while mercury is the smallest one.

-The nearest two planets to the Earth are Venous and Mars.

- The Earth planet occupies:

1- The third order acc.to the distance from the sun.

2- The fourth order (ascendingly) according to the volume.

3- The fifth order (descendingly) according to the volume.

4- The Earth has the largest gravity on its surface in the inner planet.

-The force of gravity depends on: -mass of each object (directly proportional) and distance between them(inversely proportional).

- Acceleration due to gravity is the largest on Jupiter planet,while the least on Mars planet.

Comparison between the inner planets& the outer planets:

Points	The inner planets	The outer planets
Names	Mercury, Venus, Earth& Mars.	Jupiter, Saturn, Uranus, Neptune
Distance from sun	The nearest planets to the sun.	The farthest planets from the sun.
Size	They are small solid bodies.	They are big sized (giant planets)
Density	They have high density ranges from (3.3 to 5.5 g/ cm3) Because they consists of solid bodies.	They have low density ranges from (0.7 to 1.3 g /cm^3) Because they consists of gaseous bodies .
Atmosphere	They all have an atmosphere except Mercury.	The presence of a large number of moons rotating around them.
Moon	Mercury and Venus have no moons Earth has one moon ,Mars has two moons.	They have large number of moons rotating around each of them.

Give reasons:-The presence of the hydrogen gas in a solidified state in the outer planets group.

Due to the high pressure& extreme coldness on these planet surfaces.

Moons:

-They are followers (small space bodies)that are affected by the gravity of the planets that rotate around them.

- Each planet has a certain numbers of moons around it.

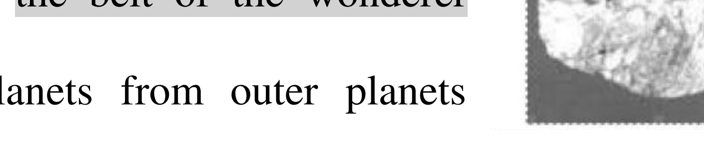
Planets	No of moons rotating around it
Mercury	None
Venus	None
Earth	1
Mars	2
Jupiter	62
Saturn	60
Uranus	27
Neptune	12

Give reason:

The moon is considered the followers of Earth planet.

Because the moon rotates around the Earth planet and it is affected by its gravity.

Asteroids:



They are rocky masses that have different size, rotate around the sun in a certain region called the belt of the wonderer Asteroids.

- This belt separates the Inner planets from outer planets between(Jupiter and Mars).

The belt of the wanderer asteroids: It is a region that separates the group of the inner planets from the outer plants.

- Some of these rocky masses penetrate the Earth's atmosphere in the form of meteors and meteorites.

Meteors:

They are small rocky masses that burn up completely when fall within the atmosphere of the Earth as a result of the heat produced from their friction with a and they can be seen as luminous arrows by the naked eye.

Give reason:

Sometimes ,we see some luminous lines in the sky at clear nights.

Due to the burning of small rocky masses when they penetrate the Earth's atmosphere as a result of heat produced from their friction with air forming meteors.

Meteorites:

They are large rocky masses that don't burn up completely when they penetrate atmosphere of the Earth and the remaining part of them without burning falls on the Earth's surface.

- The biggest Meteorite till now exists at the southern west of Africa of mass 80 tons.

Comets:

They are masses of rocks ,ice and solidified gasses that revolve around the sun in more elongated elliptical orbits intersecting with the orbits of the planets.

Structure of comets:

Comet consists of two parts :

1- **The head**

first part which Contains ice spheres which is a mixture of Solidified gases: CO_2, Nitrogen Methane gas, Rocky parts, dust& water molecules.

2- **The Tail**

Second part which Consists of a gaseous cloud.

- The most famous comet is Halley, it completes one rotation around the sun every 76 years.

The discovery of the celestial bodies:

-Astronomers discovered the celestial bodies by (Telescope)

Types of telescopes:

Refracting telescopes and **Reflecting** telescopes.



Worksheet (7)

Q.1) Complete:

1-The Earth lies between…………..and ....planets.

3-The force of gravity between two objects depends on…………………
and……………………between them.

4-The nearest planet to the sun is…………while the farthest planet is ……..….

5- Solar system includes……………., ……………., moons, ………..

6-The most famous comet inhabitants of the earth is…………………… and it completes its revolution around the sun every .... years

7-Asteroids are formed of…………………..which rotate around the………….. in a certain region .
8 -Our galaxy is called…………………………….

9 -The distance between stars are measured in ....unit

10 -The head of the comet consists of a mixture of solidified gases of…………..
……………, ………………and……………….and other compounds

11-The smallest planet is …………………, while the biggest planet is …………

5-The luminous arrows that can be seen in the sky at clear nights are called……..

Q.2) Put (√) or (X) and correct the wrong ones:

1-The distance between stars are measured in kilometers ( )

2-There are eight spherical lighted planets revolving around the sun ( )

3-The small or inner planets are Mercury, Venus, Earth and Saturn ( )

4-The outer planets are composed of rocks and they are relatively small in size. ( )

5-Milky way galaxy takes an oval shape with straight arms ( )

6-The comet consists of two parts, the head and the tail ( )

7-The telescope is used to study the celestial bodies ( )

Q.3) Give reasons:

1-The density of inner planets is high

……………………………………………………………………………………………

…………………………………………………………………………………………..

2-No one can see Halley's comet more than two times in his life

……………………………………………………………………………………………

………………………………………………………………………………………….

3-The outer planets are called giant planets

……………………………………………………………………………………………

…………………………………………………………………………………………..

4 -Stars seem as very small light points in spite of their big sizes

……………………………………………………………………………………………

…………………………………………………………………………………………….

Q.4) Compare between each pair of the following:

1-Inner planets and outer planets

…………………………………………………………………………………………..

……………………………………………………………………………………………

………………………………………………………………………………………….

2-Meteors and comets

…………………………………………………………………………………………..

…………………………………………………………………………………………..

Lesson two

The Earth

Earth's rotation around the sun:

The Earth rotates around the sun by the action of gravity and completes one revolution around the sun in 365.25 days.

Earth's location related to the sun:

-The distance between earth& sun is about **150 million Km.**

- The earth is the **third** planet regarding the distance from the sun, it is preceded by Mercury and Venus.

Earth's shape:(at the poles & equator):

- The Earth is a spherical object and has slight **flattening** at two poles and indented outward at equator.
- The tropical radius is about 22 Km larger than the polar radius.

Give reason:

The tropical radius is larger than the polar radius.

Because The Earth is slightly flattened at its poles and indented outward at the equator.

Earth's mass:

- Earth is the biggest mass (planet) in the inner planets where its mass is **5.9×10^{24} kg**.

Earth's volume:

-The Earth's occupies the medium position in the solar system.

- The Earth occupies the fourth order (ascenndingly) regarding to the volume.

- Its average radius is about 6386 Km approximately.

Give reason:

Concerning the volume, the Earth occupies the medium position in the solar system.

Because it is the biggest inner planets and it is smaller than any planet from the outer planets.

Characteristics of the earth that support the continuity of life:

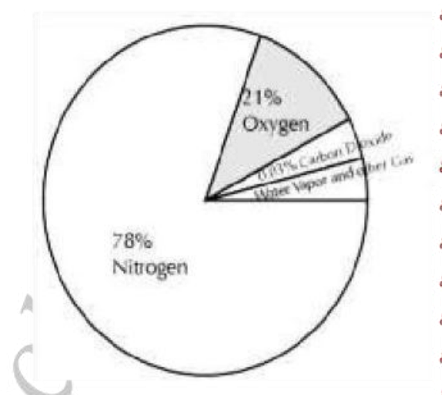
1- The atmosphere **2 - hydrosphere** 3 - **suitable temperature**

4 - Gravity **5-Suitable atmospheric pressure**

1- The Earth's Atmosphere:

Earth's atmosphere appears like **a white color**.

Earth's atmosphere consists of mixture of gases that surround the Earth



Components of the atmosphere Percentage

- Oxygen **21 %**
- Nitrogen **78 %** (major component)
- Carbon dioxide **0.03 %**
- Water vapor Variable percent
- Other gases Very little percent

Importance of atmosphere:

1- Keep temperature suitable to Earth.
2- It has ozone layer which protect us from harmful sunrays (**UV**).
3- It helps in burning of small falling meteors completely, reducing the high speed of large meteorites and burning a part of them .
4- All weather phenomena(**wind movement –clouds formation-rain falling to complete the water cycle**) occur in it.
5-It has important gases such as:

Oxygen: -It used in respiration of living organisms.
-It helps in combustion (burning) process of fuel.

Nitrogen: -It reduces the effect of oxygen gas during burning process.
- Plants use it to form proteins.

Carbon dioxide: - It used by green plants in photosynthesis procress to form the food and evolve oxygen gas.

Give reason:

The great extension of atmosphere in space is important for Earth's life.

Because it helps in complete burning of meteors and decrease speed of meteorites before reaching Earth.

What will happen if:

1- **Absence of ozone layer in the atmosphere.**

The ultraviolet rays will reach to the Earth's surface and harm living organism.

2- **There is no atmosphere.**

There will be no life on the Erath's surface and its surface is exposed to destruction due to falling of space bodies on it easily.

2- Earth's hydrosphere

- Water represents **71%** of the Earth surface and represented by **blue** color.
- Land represents **29%** of the Earth surface and represented by **green** color.
- The salty water represents **97% (oceans, seas**), while the fresh water is about **3% in (rivers, lakes, snow at two poles and ground water**).
- Ground water exists in the pores and cracks of rocks.

Importance of water

- Plant uses it in photosynthesis process.
- Keep the constancy of body temperature.
- It forms blood and helps in digestion and absorption process.
- Keep temperature suitable on land during day and night.
- More than **50%** of organisms live in water.

3- A suitable temperature:

Give reason:

Temperature on Earth's surface suits the life of living organisms.

Because Earth is in third order far from the sun makes temperature suitable for life

4- The gravity:

The Earth has the force of gravity that makes the life continues through:

1- Constancy and steadfastness of objects and living organisms on its surface.
2- Steadfastness of the hydrosphere position on its surface.
3- Keeping the Earth surrounded by the atmosphere.

Give reason:

Constancy and Steadfastness of objects and organisms on Earth's surface.
Because Earth has a force of gravity.

5- The suitable atmospheric pressure:

The suitable atmospheric pressure (air pressure) of about **76 cm Hg**.

Give reason:

The planet Earth is suitable for life.
Due to the presence of water, presence of the atmospheric envelope containing oxygen gas which is needed for life, suitable gravitational force and suitable temperature and atmospheric pressure.

The inner structure of Earth

- **The inner part of Earth was a molten form** due to high temperature.
As a result of the revolution of the Earth around its center:
Heavy metals have more density (**iron and nickel**) descended towards the Earth center while lighter components have low density descended upward.

The layers of the earth are:

1- Crust 2- mantle 3-core.

1- The crust:

- The light outer layer of the earth.
- Thickness **8 – 60** km approximately.

2- The mantle:

- The middle (second) rocky layer of the earth that lies between crust and core.
- Thickness **2885** km.

3- The core:

- The third layer of the earth.

Outer core	Inner core
It is a layer of molten metals. It's thickness is about **2100** Km.	It is a solid layer rich in iron and nickel. It's thickness is about **1350** Km

Worksheet(8)

Q.1) Put (√) or (X) and correct the wrong ones:

1-The Earth's core is formed of two layers, a molten outer core and a solid inner core ( )

2-The water of oceans is fresh water ( ) 3-

The atmospheric pressure on the Earth's surface is 76 cm.Hg ( ) 4-

Water covers about 29% of the Earth's surface ( )

5-Surrounding the Earth by an atmospheric envelope is from the characteristics supporting the continuity of life on the Earth ( )

6-Green plants use carbon dioxide in photosynthesis process ( )

Q.2) Complete:

1-The normal atmospheric pressure on the Earth's surface is about …………

2-The Earth's core is divided into……………….core and............... core

4-Concerning the volume, the Earth is the biggest…..........................Planet.

5-The Earth revolves around the sun by the action of………………..to complete one revolution around the sun in… .... days

6-More than……………….of known living organisms live in the aquatic environment.

7-The Earth's inner core contains………………..in a solid state

8-The earth's shape is to be completely circular accompanied with

………………..at the two poles and .... at the equator

9-…………………..and…………………are from characteristics of the planet Earth supporting the continuity of life

10--The outer layer of the Earth is called…………………..and the next one is called…………………

5-The percentage of carbon dioxide gas in the atmospheric air is………, while the percentage of oxygen gas is………………….

6-The major component of the atmosphere is………………gas and it occupies about………………of the air volume

Q.3) Give reasons:

1-Steadfastness of the hydrosphere on the Earth's surface

………………………………………………………………………………………
………………………………………………………………………………………

2 -The earth's inner core is rich in iron and nickel

………………………………………………………………………………………
………………………………………………………………………………………

Q.4) What is meant by:

1-Earth's atmosphere

………………………………………………………………………………………
……………………………………………………………………………………..

Lesson 3

Rocks and Minerals

Component of the Earth's crust:

1-The soil: It is a thin non-compacted layer, which covers the Earth's crust.

It is superficial (upper) layer, thin, fragmented and loosened layer.

It is consists of a mixture of mineralogical substances, water, air, decayed organic materials and plant roots.

2- **The solid basis:**
Lower layer of the Earth's crust beneath the soil.
It consists of different types of rocks.

Rocks:

A natural solid material exists in the earth's crust and it is formed of one mineral or a group of minerals.

Types of rocks 1- Igneous rocks. 2- Sedimentary rocks. 3- Metamorphic rocks.

First: Igneous rocks:

They are rocks formed by solidification of the magma underneath the Earth's crust or lava on the Earth's surface.

From the previous lesson, the outer core of the Earth contains molten metals which are known as magma.

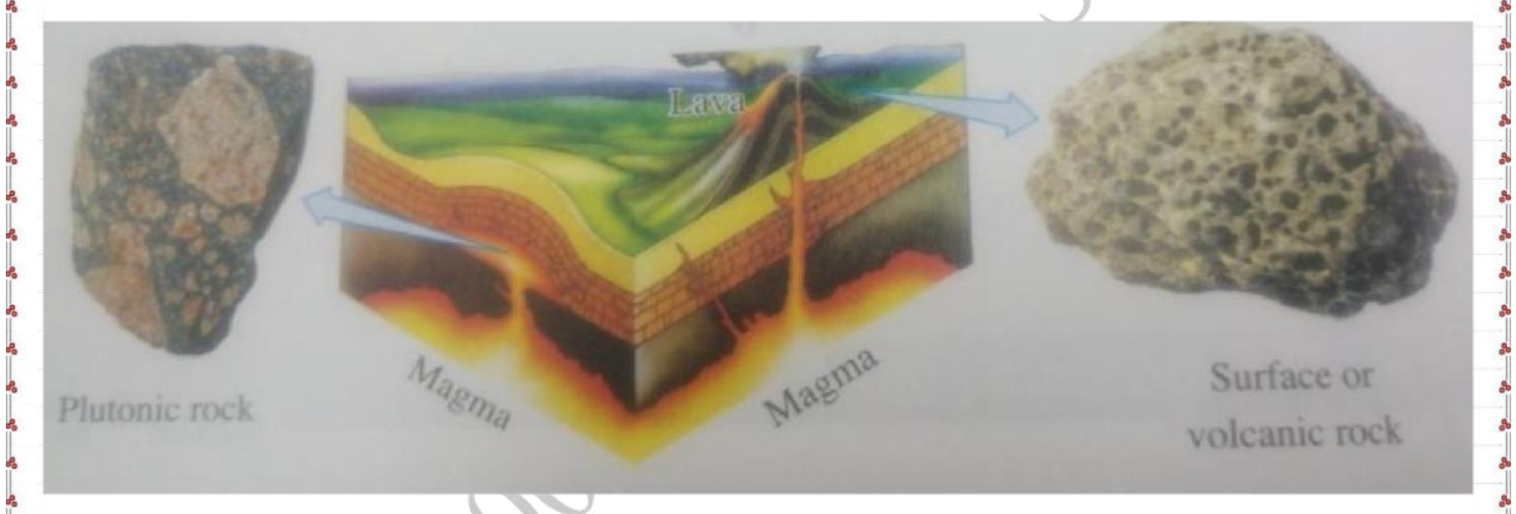
Magma: It is a very hot thick (viscous) liquid underneath the Earth's crust.

Lava: It is the magma when it reaches the Earth's surface.
Or it is the volcanic flows that spread on the volcanic sides.

--Magma and lava cool and solidify ,they form igneous rocks.

<u>Igneous rocks can be divided into (plutonic rocks and volcanic rocks).</u>

Plutonic rocks	Volcanic(surface) rocks
-They are formed in the depth of the Earth's crust . -They have coarse texture. **Because** the size of crystals of minerals forming them is large. -Cool slowly and take a long time to crystallize ,**so** their crystals are larged –sized. **Ex. Granite**.	-They are formed over the Earth's surface. -They have smooth texture. Because the size of crystals of minerals forming them is small. -Lava cools quickly and take a short time to crystallize ,**so** their crystals have small sized **Ex. Basalt**.



<u>Give reason:</u>

The volcanic rocks contain small circular holes.

Due to the extruding of gases from volcanic flows during their cooling and formation of rock.

<u>Granite:</u>

- Its colour is pink or grey.
- The crystals of minerals forming it are seen by the naked eye (big).
- It exists in the eastern desert and Sinai Peninsula.
- The minerals forming the granite are **quartz, feldspar and mica**.

Basalt



- It is a dark colored rock.
- Its components cannot be seen by the naked eye (small).
- It exists in Abu-Zaabal and close to Abu-Rewash and Fayoum.
- The minerals forming the basalt are **Olivine, pyroxene and feldspar minerals**.

Second: Sedimentary rocks:

-They are **5%** only of the total volume of the Earth's crust rocks.
- They form a thin cover ,that wrap about 75% of the surface of the Earth's solid mass.

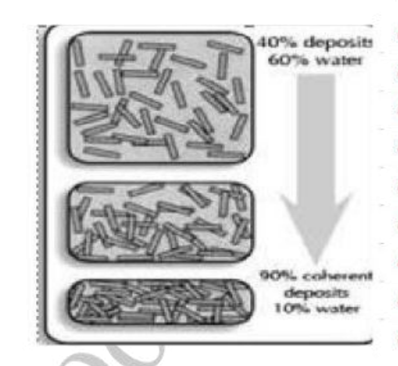
Sedimentary rocks:
They are rocks formed from the cohesion of sediments.
Or They are rocks formed from fragmentation and sedimentation of old rocks.

-Formation of sedimentary rocks: By 3 Steps:
1- Erosion (fragmentation and disintegration).
2- Transportation.
3-Sedimentation (deposition).

1. Erosion (fragmentation and disintegration) of the igneous, sedimentary or metamorphic rocks that are previously existed.
2. Transportation of the detritus (fragmented particles of rocks) by water currents or by air, where these particles are deposited.
3. Sedimentation (deposition) of rocks particles in an aqueous or an aerial medium, later these deposited particles adhere together forming the sedimentary rocks.

Give reason: **The cohesion of layers of sedimentary rocks increases by passing time**.

Because the sediments of the bottom layers are exposed to high pressure resulted from the weight of the deposits above them ,this causes a decrease in the ratio of water existing between the grains.



Examples

1. Sandstone:

- It consisted of sand grains that are less than 2mm in diameter.
- Colour: **yellow**.
- Texture: **coarse**.
- Shape: **thin layers**.
- Coherences: **cohesive.**

2. Limestone:

- Consists of precipitation of **calcium carbonate ($CaCo_3$) in lime solutions**.
- Colour: **white.**
- Texture: **smooth**.
- Shape: **thin layers**.
- Coherences**: less cohesive**.



Note: Limestone reacts with hydrochloric acid producing effervescence **due to the evolving of carbon dioxide gas.**

But in sandstone **no reaction takes place**.

Third: Metamorphic rocks

The rocks which are formed from igneous or sedimentary rocks when they are subjected to **high temperature and pressure** .

Metamorphic rocks:

They are rocks originated as a result of exposing the old rocks (igneous or sedimentary) to the factors of pressure and high temperature.

Example:

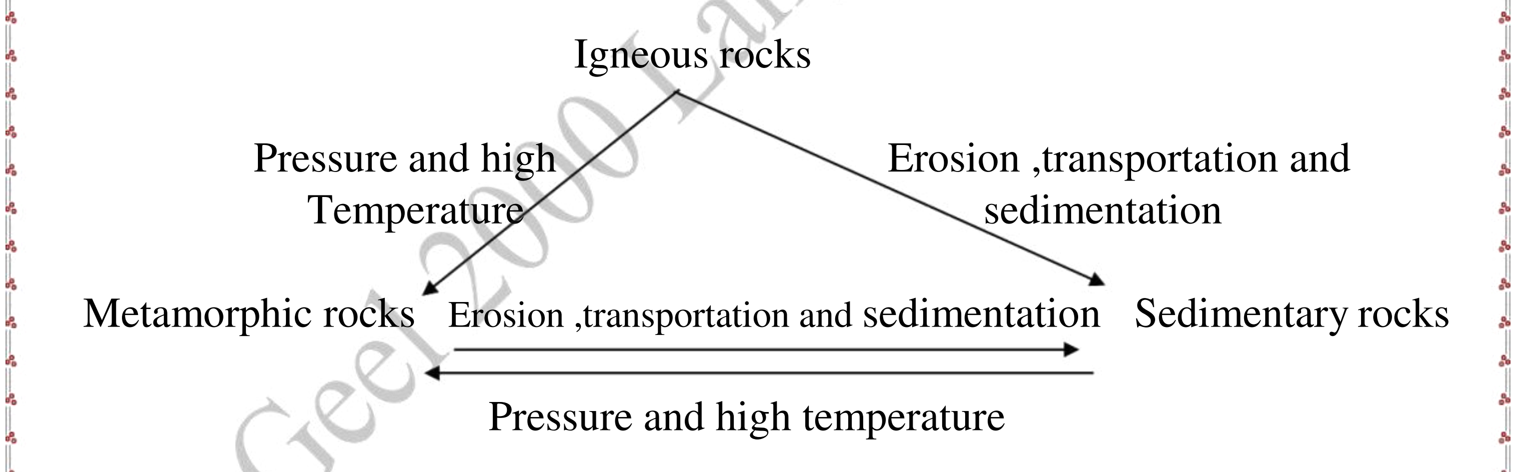
Marble:

1-It is produced from the conversion of **limestone**.

2- It has more solidity and cohesive than the lime stone.

3- Its texture is coarse (rough).

4- Its color is white if it is pure and has other colours when it contains impurities.



Worksheet (9)

Q.1) Complete:

1- Granite is from……………….igneous rocks, while the basalt is from ………igneous.

2-The colour of limestone is……………and its texture is………., while the colour of sandstone is………………..and its texture is …………………

3-Marble is resulted from transformation of…………………..

4-Plutonic rocks have crystals with .... size, while volcanic rocks have crystals with… .... size.

6-The soil consists of a mixture of .... air, decayed ……………..materials and plant roots.

7-When hydrochloric acid is added to limestone, …………………gas is evolved

8-Rocks are classified according to the way of formation into……….,…….. and…………………

9 -The sequence of sedimentary rocks formation is………, …………………….. and……………………..

10-…………and………………..are examples of sedimentary rocks.

Q.2) Give reason:

1-The crystals of minerals that form the plutonic igneous rock are large sized …………………………………………………………………………………………… ……………………………………………………………………………………

2-Some kinds of marble have colours …………………………………………………………………………………………. ………………………………………………………………………………………….

3-Effervescence is produced when hydrochloric acid is added to a sample of limestone

…………………………………………………………………………………………

……………………………………………………………………………… …

3-Granite has a coarse texture, while Basalt has a smooth texture

…………………………………………………………………………………………

…………………………………………………………………………………

<u>Q.3)</u> <u>What is meant by?</u>

1-lava

……………………………………………………………………………..

2-Magma

………………………………………………………………………………

3-Igneous rocks

…………………………………………………………………………………………

4-Soil

………………………………………………………………………………

5-Metamorphic rocks

………………………………………………………………………………

6-Sedimentary rocks

…………………………………………………………………………………………

<u>Q.4)</u> <u>What will happen if</u>:

1-Sedimentary rocks are subjected to high temperature and pressure

…………………………………………………………………………………………

……………………………………………………………………………….

2-The minerals that form the volcanic igneous rocks take a short time of crystallization

…………………………………………………………………………………………

……………………………………………………………………………..

3-You add Hydrochloric acid to limestone

…………………………………………………………………………………………

……………………………………………………………………………….

4-Decreasing the temperature of lava on the earth's surface rapidly

…………………………………………………………………………………………